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IS 8328 (2007): Free cutting copper bars, rods and sections [MTD 8: Copper and Copper Alloys]

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सुकटय ताँबे के सरीये, छड़े एवं सैक्शन – विशिष्टि

(पहला पुनरीक्षण)

Indian Standard

FREE CUTTING COPPER BARS, RODS AND SECTIONS — SPECIFICATION

(First Revision)

ICS 77.150.30

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BUREAU OF INDIAN STANDARDS
MANAK BHAVAN, 9 BAHADUR SHAH ZAFAR MARG
NEW DELHI 110002

January 2007 **Price Group 3**

FOREWORD

This Indian Standard (First Revision) was adopted by the Bureau of Indian Standards, after the draft finalized by the Copper and Copper Alloys Sectional Committee had been approved by the Metallurgical Engineering Division Council.

This standard was first published in 1977. While reviewing this standard in the light of experience gained during these years, the Committee decided to revise it in line with present practice being followed by Indian industry. In this revision, following modifications has been made:

a) A new clause on references has been incorporated,

b) Clauses for condition of delivery, freedom from defects, chemical composition, sampling, retest and criteria for conformity have been modified,

c) One more grade of phosphorized high residual phosphorous-tellurium copper alloy which is most suitable and widely used for gas welding nozzles has been added,

d) Mechanical properties and electrical properties have been modified, and

e) Requirement of test certificate is added.

The composition of the Committee responsible for the formulation of this standard is given in Annex A.

For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS 2 : 1960 'Rules for rounding off numerical values (*revised*)'. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

Indian Standard

FREE CUTTING COPPER BARS, RODS AND SECTIONS — SPECIFICATION

(First Revision)

1 SCOPE

This standard covers the requirements for free cutting leaded-copper and tellurium-copper bars, rods and sections.

2 REFERENCES

The following standards contain provisions, which through reference in this text, constitute provisions of this standard. At the time of publication, the editions indicated were valid. All standards are subject to revision and parties to agreements based on this standard are encouraged to investigate the possibility of applying the most recent editions of the standards indicated below:

IS No.	*Title*
440 : 1964	Methods of chemical anlysis of copper (*revised*)
1387 : 1993	General requirements for the supply of metallurgical materials (*second revision*)
1608 : 2005	Metallic materials — Tensile testing at ambient temperature (*third revision*)
1817 : 1961	Methods of sampling non-ferrous metals for chemical analysis
2826 : 1986	Dimensions and tolerances for copper and copper alloy, rods and bars for general engineering purposes (*third revision*)
3288	Glossary of terms relating to copper and copper alloys :
(Part 1) : 1986	Materials (*third revision*)
(Part 3) : 1986	Wrought forms
3863 : 1966	Methods of chemical analysis of copper-tellurium alloy

3 TERMINOLOGY

For the purpose of this standard, the definitions given in IS 3288 (Part 1 and Part 3) shall apply.

4 SUPPLY OF MATERIAL

General requirements relating to the supply of material shall be as laid down in IS 1387.

5 FREEDOM FROM DEFECTS

The material shall be clean, smooth, free from surface defects like blisters, silvers, scales, fins, spills, cracks and internally sound free defects like porosity, piping, etc.

6 CONDITION OF DELIVERY

The material shall be supplied in any one of the following conditions as specified by the purchaser:

a) Half hard (HB), and

b) Hard (HD).

7 DIMENSIONS AND TOLERANCES

7.1 Sizes

The material shall be supplied in sizes as specified in IS 2826 or as required by the purchaser.

7.2 Tolerances

The tolerances on sizes of bars/rods shall be as specified in IS 2826.

7.2.1 The tolerances for sections shall be as agreed to between the purchaser and the supplier/manufacturer and shall be stated in the order.

8 CHEMICAL COMPOSITION

8.1 The material shall conform to the chemical composition as specified in Table 1.

8.2 The chemical analysis of leaded copper and tellurium copper shall be carried out in accordance with IS 440 and IS 3863 respectively or any other established instrumental/chemical method. In case of dispute the procedure specified in the latest version of IS 440 and IS 3863 for chemical analysis, shall be the referee method. However when the method is not given in IS 440 and IS 3863, the referee method shall be as agreed to between the purchaser and manufacturer.

8.3 Alternatively the methods specified in relevant ISO/IEC Standard may be used.

9 MECHANICAL PROPERTIES

9.1 The material when tested for tensile test in accordance with IS 1608 shall conform to the requirements given in Table 2.

Table 1 Chemical Composition

(*Clause* 8.1)

Sl No.	Elements	Percentage		
		Grade 1	Grade 2	Grade 3
(1)	(2)	(3)	(4)	(5)
i)	Copper and silver, *Min*	99.05	99.20	98.40
ii)	Tellurium	0.5 to 0.8	0.3 to 0.7	-
iii)	Lead	-	-	0.80 to 1.50
iv)	Phosphorous	0.015 to 0.050	-	-
v)	Total impurities, *Max*	0.10	0.10	0.10

Table 2 Tensile Properties

(*Clause* 9.1)

Sl No.	Condition Common to All Alloys	Size		Tensile Strength *Min*, MPa	Elongation on Gauge Length $5.65\sqrt{A}$, *Min* Percent
		Over mm	Up to and Including mm		
(1)	(2)	(3)	(4)	(5)	(6)
i)	Half hard	6	10	260	10
	(HB)	10	32	260	10
		32	50	240	15
		50	–	230	18
ii)	Hard	6	10	315	6
	(HD)	10	32	305	8
		32	50	275	10
		50	–	260	12

NOTE — $1 N/mm^2 = 0.102 kgf/mm^2 = 1 MPa$.

9.1.1 The tensile test shall be made on test pieces machined to shape and largest dimensions practicable as specified in IS 1608 from the samples selected in accordance with **11.4**.

9.1.2 Up to and including 32 mm rods/bars, the material longitudinal axis of the test pieces shall be the same as that of the rods/bars.

9.1.3 In case of rods/bars over 32 mm, the central longitudinal axis of the test piece shall be at least 16 mm from the nearest face/surface.

9.1.4 The fractured test piece shall be free from pipe and other surface defects.

9.1.5 Should a tensile test piece break outside the middle third of the gauge length and the elongation percentage obtained be lower than minimum specified, the test may be discarded and another test made.

10 ELECTRICAL RESISTIVITY

10.1 The electrical resistivity of Grade 2 and Grade 3 shall not exceed to 0.020 3 ohm/mm²/m. The equivalent conductivity will be 85 percent IACS minimum.

10.2 Grade 1 is not intended for electrical application and therefore has no resistivity requirement.

10.3 Electrical resistivity test need not be made except when indicated by the purchaser at the time of placing the order.

11 SAMPLING AND CRITERIA FOR CONFORMITY

11.1 Unless otherwise agreed to between the purchaser

and the supplier/manufacturer the following sampling procedure and criteria for conformity shall hold good.

11.2 Lot

In any consignment, all the material of same grade, size and temper manufactured from the same raw material, produced at the same place, shall be grouped together to constitute a lot.

11.3 Material shall be examined for freedom from defects and for tolerances on diameter/ dimensions. Any bar/rod/section found defective shall be rejected.

11.4 From the material found satisfactory in **11.3** one sample shall be selected from each lot or part thereof to provide necessary test pieces for all the tests (chemical analysis, tensile test and electrical resistivity). Mass of each lot vary with the size of material and is given in Table 3.

NOTE — The material required for chemical analysis from the selected bar/rod/section shall be taken in accordance with IS 1817.

11.5 The lot shall be accepted, if the samples tested meet all the chemical composition, tensile, properties and electrical resistivity (if required by the purchaser) requirements to the specification.

12 RETEST

12.1 If a result of chemical analysis fails to satisfy the requirements for any of the constituents, two more tests for that constituents shall be done on the same sample in order to confirm that the analysis has been done properly. If both the test results satisfy the relevant requirements, the lot shall be considered as conforming to this specification, otherwise not.

12.2 If any of the test pieces first selected fails to pass the requirements of tensile properties and electrical resistivity test, two further sample from the same lot shall be selected for testing, one of which shall be from the same piece of material from which the original sample was taken, unless it is withdrawn by the supplier.

12.2.1 If the test piece from both these additional samples pass the lot represented by the test samples shall be deemed to comply with this standard. If the test piece from either of these additional samples fail the lot represented by the test samples shall be rejected.

13 PACKING

The material shall be packed in bundles, boxes, cases or crates or as required by the purchaser, so as to ensure the safe transportation of the material and avoid damage in transit.

14 MARKING

14.1 Each package shall be tagged with the suitable metal tag which shall be marked with the following details:

a) Dimensions,
b) Mass,
c) Grade/Chemical composition,
d) Temper,
e) Lot number,
f) Date of manufacture,
g) Name and/trade-mark of manufacturer, and
h) Any other information required by the purchaser.

14.2 BIS Certification Marking

The material may also be marked with the Standard Mark.

Table 3 Lot Size

(*Clause* 11.4)

Sl No.	Specified Size (Diameter or Width Across Flats) of Material		Mass of Each Lot
	Over mm	Up to and Including mm	kg
(1)	(2)	(3)	(4)
i)	–	12	1 000
ii)	12	50	2 000
iii)	50	–	4 000

NOTE — When the order does not permit forming lots in the above quantity the lot size shall be as agreed to between the supplier and the purchaser.

14.2.1 The use of the Standard Mark is governed by the provision of the *Bureau of Indian Standards Act*, 1986 and the Rules and Regulations made thereunder. The details of the conditions under which the licence for the use of the Standard Mark may be granted to manufacturers or producers may be obtained from the Bureau of Indian Standards.

15 TEST CERTIFICATE

The supplier shall provide the test certificate for each consignment giving information like lot number, size, grade and temper of the material with corresponding chemical composition, tensile properties and electrical resistivity test result.

16 INFORMATION TO BE GIVEN BY THE PURCHASER

This standard contains a number of clauses in which the purchaser is allowed to exercise an option. The purchaser should provide following information at the time of placing the order:

a) Whether the purchaser wished to inspect the material at the supplier's works (*see* **3**),

b) Grade and temper of the material (*see* **8** and **6**),

c) Dimensions and tolerances (*see* **7**),

d) Sampling and criteria for conformity (*see* **11**),

e) Packing details (*see* **13**),

f) Marking details (*see* **14**), and

g) Whether test certificate required by the purchaser (*see* **15**).

ANNEX A

(*Foreword*)

COMMITTEE COMPOSITION

Copper and Copper Alloys Sectional Committee, MTD 8

Indian Copper Development Centre, Kolkata	DR D. DE SARKAR (*Chairman*)
Agarwal Metal Works, Rewari	SHRI D. K. JAIN SHRI O. P. RANA (*Alternate*)
Alcobex Metals Ltd, Jodhpur	SHRI G. C. KANUNGO SHRI S.D. PUROHIT (*Alternate*)
All India Air Conditioners & Refrigeration Association, Delhi	SHRI A. H. GIDWANI SHRI A. P. KHURANA (*Alternate*)
Bhabha Atomic Research Centre, Mumbai	SHRI V. K. TANGRI SHRI S. K. GUPTA (*Alternate*)
Bharat Electronics Ltd, Bangalore/Ghaziabad	SHRI SRIDHAR S. NADIGER SHRI ANUJ SINGH (*Alternate*)
Bharat Heavy Electricals Ltd, Bhopal	REPRESENTATIVE
Birla Copper Ltd, Bharuch	SHRI A. N. CHAKARVARTI SHRI B. M. SHARMA (*Alternate*)
Crompton Greaves Ltd, Mumbai	REPRESENTATIVE
DGS&D (Quality Assurance Wing), Kolkata/New Delhi	SHRI B. DAS GUPTA SHRI S.K. PANDEY (*Alternate*)
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Hindustan Copper Ltd, Kolkata	SHRI P. N. GANGOPADHYAY
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Ministry of Defence (DMRL), Hyderabad	DR S. NAGARJUNA
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SHRI DEEPAK JAIN
Scientist 'E' (MTD), BIS

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